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ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
CYCLE 29 STARTUP REPORT

In accordance with Technical Specification 6.9.a.1, Startup Report, attached is the Kewaunee Power Station Cycle 29 Startup Report. Rod drop times were inadvertently omitted from the Startup Report and are provided separately as attachment 2 to this letter.

If you have questions or require additional information, please feel free to contact Mr. J. F. Helfenberger at 920-388-8294.

Very truly yours,

Michael J. Wilson
Director Safety and Licensing
Kewaunee Power Station

Attachments
1. Cycle 29 Startup Report
2. Cycle 29 Startup Report, Rod Drop Times

Commitments made by this letter: NONE

IE26
NRR

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Serial No. 08-0380

ATTACHMENT 1

CYCLE 29 STARTUP REPORT

KEWAUNEE POWER STATION
DOMINION ENERGY KEWAUNEE, INC.

Table of Contents

1.0 SUMMARY

Low Power Physics Testing and Power Ascension Testing for Kewaunee Cycle 29 identified no unusual core response or reactivity anomalies. All measured core parameters were determined to be within their acceptance criteria. All Technical Specification surveillance requirements were met.

2.0 INTRODUCTION

The Kewaunee Cycle 29 fuel reload was completed on April 27, 2008. The attached core map (Figure 1) shows the final core configuration. Cycle 29 uses a low leakage loading pattern consisting of 45 new Region 31 fuel assemblies, 44 Region 30 once-burned fuel assemblies, and 32 Region 29 twice-burned fuel assemblies.

Subsequent operational and testing milestones were completed as follows:

Initial Criticality	May 08, 2008
Low Power Physics Testing completed	May 09, 2008
Main Turbine Online	May 09, 2008
30% Power Testing completed on	May 10, 2008
50% Power Testing completed on	May 11, 2008
100% Power Testing completed on	May 16, 2008

3.0 FUEL DESIGN

All fuel assemblies in Cycle 29 are of the Westinghouse 14x14 422V+ assembly design. There are 45 fresh Region 31 assemblies with 20 of the assemblies (Region 31A) being enriched to 4.00 weight percent Uranium-235 (w/o U^{235}) and contain various loadings of 1.25x IFBA rods. The remaining 25 assemblies (Region 31B) are enriched to 4.40 weight percent Uranium-235 (w/o U^{235}) with 9 of the assemblies containing various loadings of 1.25x IFBA rods. All assemblies in the core contain six inches of axial blankets at the top and bottom enriched to 2.60 w/o U^{235}. The axial blankets are annular pellets with the exception that solid pellets are used in all fuel rods containing gad.

4.0 LOW POWER PHYSICS TESTING

The low power physics testing program for Cycle 29 (Reference 6.1) was completed using the FTI Reactivity Measurement and Analysis System (RMAS). Note that RMAS v.6 was used for KEW29 Startup Physics Testing. This program consisted of the following: Critical Boron Endpoint measurements for All Rods Out (ARO), Moderator/Isothermal Temperature Coefficient measurements, and Control and

Shutdown Bank Worth measurements. Low power physics testing was performed at a power level below the point of nuclear heat to avoid nuclear heating reactivity feedback effects.

4.1 Critical Boron Concentration

The critical boron concentration was measured for the All Rods Out configuration. The measured values include corrections to account for differences between the measured critical rod configuration and the ARO configuration. The acceptance criteria of ±50 ppm was met for the ARO configuration.

Critical Boron Endpoint Results

	Measured (ppm)	Predicted (ppm)	M-P (ppm)	Acceptance Criteria (ppm)
All Rods Out (ARO)	2393	2396	-3	± 50

4.2 Moderator Temperature Coefficient

Isothermal Temperature Coefficient (ITC) data was measured near All Rods Out conditions. Controlled heat-ups and cool-downs were performed and the reactivity change was measured. These measurements were then averaged to determine the measured ITC. They were then compared to the design predictions, which were adjusted to measured conditions. The review criteria of ±3 pcm/ °F of the predictions were met.

The Moderator Temperature Coefficient (MTC) of 1.699 pcm/°F was determined by subtracting the design Doppler Temperature Coefficient (-1.721 pcm/°F) from the measured Isothermal Temperature Coefficient of –0.022 pcm/°F. The Technical Specification Limit of MTC < +5.0 pcm/°F at ARO Hot Zero Power (HZP) was met.

Isothermal/Moderator Temperature Coefficient Results

	Measured (pcm/°F)	Predicted (pcm/°F)	M-P (pcm/°F)	Acceptance Criteria (pcm/°F)
ARO ITC	-0.022	-0.280	0.258	N/A
ARO MTC	1.699	1.442	NA	MTC < +5.0

4.3 Control Rod Reactivity Worth Measurements

The integral reactivity worths of all RCCA Control and Shutdown Banks were measured using the rod swap technique (Reference 6.2). The initial step of the rod swap method diluted the predicted most reactive control rod bank (hereafter referred to as the reference bank) into the core and measured its reactivity worth using conventional test techniques. The reactivity changes resulting from the reference bank movements were recorded continuously by the reactivity computer and were used to determine the differential and integral worth of the reference bank. For Cycle 29, Control Bank C was used as the reference bank.

The acceptance criteria are as follows: The measured worth of the Reference Bank be within ±10% of the predicted worth; the worth of a test bank be within ±15% of the predicted worth for banks > 600 pcm: the worth of a test bank be within 100 pcm of the predicted worth for banks ≤ 600 pcm; the sum of the measured worths of all banks is within ±10% of the sum of the predicted worths.

Control Bank Integral Worth Results

BANK	MEASURED WORTH (PCM)	PREDICTED WORTH (PCM)	M-P (pcm)	PERCENT DIFFERENCE (%) (M-P)/P X 100
A	801	816	-15	-1.8
B	636	599	37	6.2
C	880	864	16	1.9
D	786	790	-4	-0.5
SA	651	635	16	2.5
SB	653	635	18	2.8
Total	4407	4339	68	1.6

The measured results of the individual bank worths and the total control bank worth showed excellent agreement with the predicted values. All individual and total worth acceptance criteria were met.

5.0 POWER ASCENSION TESTING

5.1 Power Distribution, Power Peaking and Tilt Measurements

The core power distribution was measured through the performance of a series of flux maps during the power ascension in accordance with Reference 6.3. The results from the flux maps were used to verify compliance with the power distribution Technical Specifications.

A summary of the Measured Axial Flux Difference (AFD) and INCORE Tilt for the flux maps performed during the power ascension is provided below. Additional tables provide comparisons of the most limiting measured Heat Flux Hot Channel Factor (**F_Q**) and Nuclear Enthalpy Rise Hot Channel Factor (**F_Δ**h), including uncertainties, to their respective limits from each of the flux maps performed during the power ascension. The most limiting **F_Q** is based on margin to the limit which varies as a function of core height.

As can be seen from the data presented, all Technical Specification limits were met and no abnormalities in core power distribution were observed during power ascension.

Measured Axial Flux Difference and INCORE Tilt

Power (%RTP)	Burnup (MWD/MTU)	Rod Position (steps)	Axial Offset (%)	INCORE Tilt
27.1	3.5	151	0.748	1.019
49.6	17.3	187	5.792	1.011
99.6	193	225	2.549	1.003

Comparison of Measured F_Q to F_Q^{RTP} limit

Power (%RTP)	Burnup (MWD/MTU)	Measured F_Q	F_Q^{RTP} steady state limit	Margin to Limit
27.1	3.5	2.379	5.000	52.42 %
49.6	17.3	2.194	5.000	56.12 %
99.6	193	2.020	2.510	19.53 %

Comparison of Measured $F_{\Delta}h$ to $F_{\Delta}h$ limit

Power (%RTP)	Burnup (MWD/MTU)	Measured $F_{\Delta}h$	$F_{\Delta}h$ limit	Margin to Limit
27.1	3.5	1.599	2.072	22.82 %
49.6	17.3	1.553	1.957	20.66 %
99.6	193	1.505	1.702	11.57 %

Presented in Figures 2, 3 and 4 are measured Power Distribution Maps showing percent difference from the predicted power for the 30%, 50%, and 100% power plateaus. From this data it can be seen that there is good agreement between the measured and predicted assembly powers.

5.2 Reactor Coolant System Flow Measurement

The Reactor Coolant Flow rate was determined in accordance with Reference 6.3 using a secondary calorimetric heat balance for each loop using the steam generators as the control volumes. Steam generator blowdown was not isolated during the data acquisition period. The measured reactor coolant flow met the Technical Specification Limit of > 178,000 gpm and the more limiting COLR value of > 186,000 gpm.

Reactor Coolant System Flow Results

Measured Flow (gpm)	Flow Limit (gpm)	Acceptance Criteria (ppm)
194321	186000	> 186000

6.0 REFERENCES

6.1 NF-KW-RET-002, "Low Power Physics Test"

6.2 Westinghouse Electric Corporation, "Rod Exchange Technique for Rod Worth Measurement" and "Rod Worth Verification Tests Utilizing RCC Bank Interchange."

6.3 NF-KW-RET-008 "Power Escalation Tests"

7.0 FIGURES

FIGURE 1
CORE LOADING PATTERN
KEWAUNEE - CYCLE 29

	1	2	3	4	5	6	7	8	9	10	11	12	13	
						29B G87	29A G59	29B G93						A
				29A G63	29A G77	31B J73	31A J51	31B J76	29A G75	29A G51				B
			29A G83	31B J78	31B J88	31A J57	30 H81	31A J60	31B J90	31B J84	29A G81			C
		29A G60	31B J85	31A J62	30 H71	30 H83	30 H75	30 H85	30 H72	31A J68	31B J72	29A G61		D
		29A G80	31B J91	30 H68	30 H94	30 H53	31A J69	30 H57	30 H84	30 H70	31B J92	29A G79		E
	29B G89	31B J86	31A J56	30 H80	30 H64	30 H66	30 H65	30 H59	30 H54	30 H93	31A J70	31B J74	29B G94	F
180°	29A G66	31A J52	30 H89	30 H76	31A J58	30 H51	31B J95	30 H56	31A J65	30 H77	30 H82	31A J53	29A G62	G
	29B G90	31B J81	31A J66	30 H88	30 H61	30 H52	30 H60	30 H62	30 H55	30 H87	31A J63	31B J82	29B G88	H
		29A G72	31B J93	30 H74	30 H79	30 H58	31A J64	30 H63	30 H90	30 H69	31B J87	29A G85		I
		29A G54	31B J79	31A J59	30 H73	30 H86	30 H78	30 H92	30 H67	31A J61	31B J80	29A G65		J
			29A G74	31B J75	31B J94	31A J55	30 H91	31A J67	31B J89	31B J77	29A G73			K
				29A G56	29A G84	31B J71	31A J54	31B J83	29A G78	29A G53				L
						29B G92	29A G52	29B G91						M

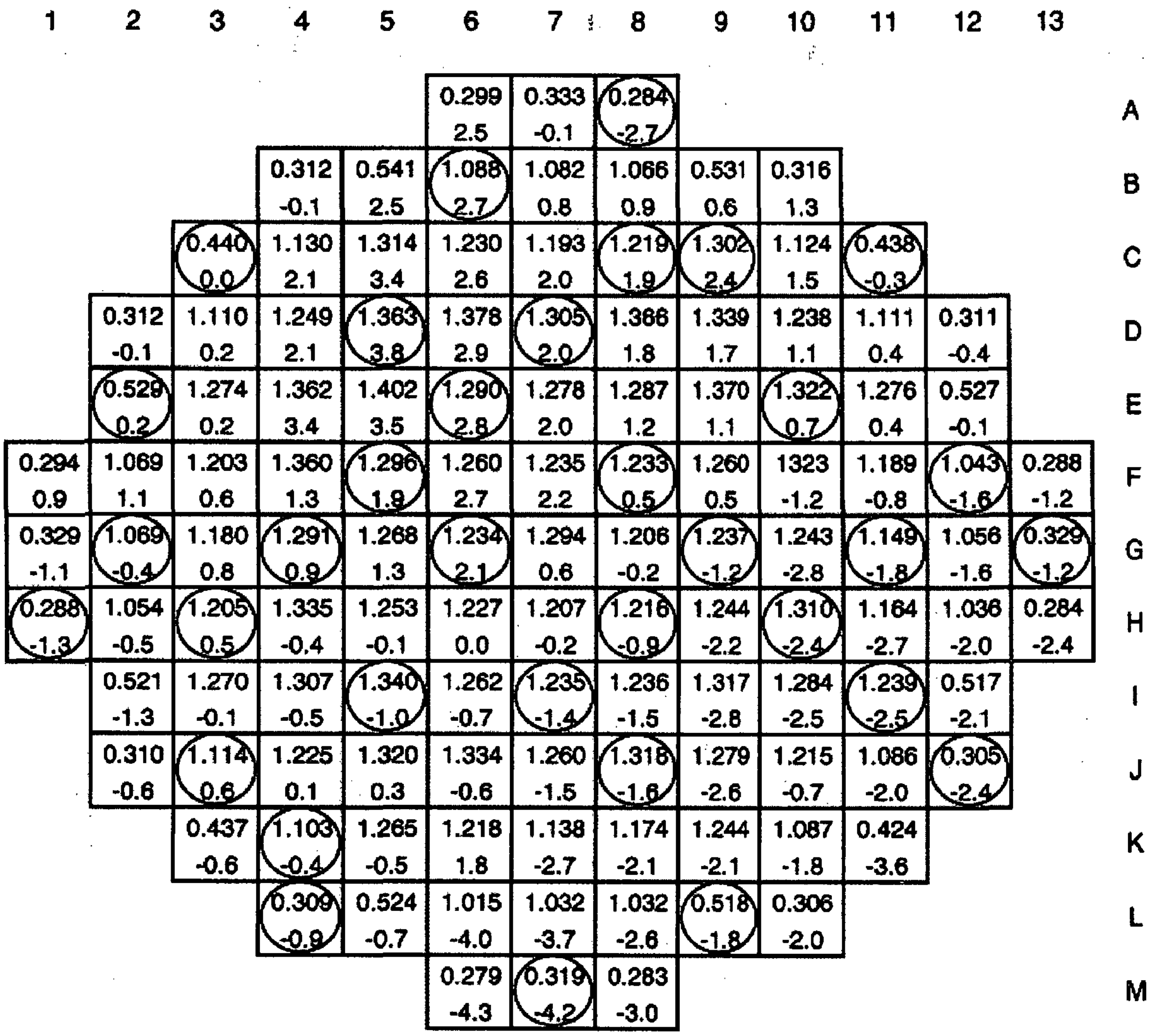
90°

LEGEND

R	Region Identifier
ID	Fuel Assembly Identifier

REGION	ASSEMBLIES	ENRICHMENT
29A	24	4.60
29B	8	4.94
30	44	4.95
31A	20	4.00
31B	25	4.40

FIGURE 2
INCORE Power Distribution - 27.1%
KEWAUNEE - CYCLE 29



1	2	3	4	5	6	7	8	9	10	11	12	13	
					0.299 2.5	0.333 -0.1	0.284 -2.7						A
			0.312 -0.1	0.541 2.5	1.088 2.7	1.082 0.8	1.066 0.9	0.531 0.6	0.316 1.3				B
		0.440 0.0	1.130 2.1	1.314 3.4	1.230 2.6	1.193 2.0	1.219 1.9	1.302 2.4	1.124 1.5	0.438 -0.3			C
	0.312 -0.1	1.110 0.2	1.249 2.1	1.363 3.8	1.378 2.9	1.305 2.0	1.366 1.8	1.339 1.7	1.238 1.1	1.111 0.4	0.311 -0.4		D
	0.529 0.2	1.274 0.2	1.362 3.4	1.402 3.5	1.290 2.8	1.278 2.0	1.287 1.2	1.370 1.1	1.322 0.7	1.276 0.4	0.527 -0.1		E
0.294 0.9	1.069 1.1	1.203 0.6	1.360 1.3	1.296 1.9	1.260 2.7	1.235 2.2	1.233 0.5	1.260 0.5	1323 -1.2	1.189 -0.8	1.043 -1.6	0.288 -1.2	F
0.329 -1.1	1.069 -0.4	1.180 0.8	1.291 0.9	1.268 1.3	1.234 2.1	1.294 0.6	1.206 -0.2	1.237 -1.2	1.243 -2.8	1.149 -1.8	1.056 -1.6	0.329 -1.2	G
0.288 -1.3	1.054 -0.5	1.205 0.5	1.335 -0.4	1.253 -0.1	1.227 0.0	1.207 -0.2	1.216 -0.9	1.244 -2.2	1.310 -2.4	1.164 -2.7	1.036 -2.0	0.284 -2.4	H
	0.521 -1.3	1.270 -0.1	1.307 -0.5	1.340 -1.0	1.262 -0.7	1.235 -1.4	1.236 -1.5	1.317 -2.8	1.284 -2.5	1.239 -2.5	0.517 -2.1		I
	0.310 -0.6	1.114 0.6	1.225 0.1	1.320 0.3	1.334 -0.6	1.260 -1.5	1.318 -1.6	1.279 -2.6	1.215 -0.7	1.086 -2.0	0.305 -2.4		J
		0.437 -0.6	1.103 -0.4	1.265 -0.5	1.218 1.8	1.138 -2.7	1.174 -2.1	1.244 -2.1	1.087 -1.8	0.424 -3.6			K
			0.309 -0.9	0.524 -0.7	1.015 -4.0	1.032 -3.7	1.032 -2.6	0.518 -1.8	0.306 -2.0				L
					0.279 -4.3	0.319 -4.2	0.283 -3.0						M

☐ Measured Power
Percent Difference (M-P)/P

○ Measured Location

FIGURE 3
INCORE Power Distribution - 49.6%
KEWAUNEE - CYCLE 29

1	2	3	4	5	6	7	8	9	10	11	12	13	
					0.301 2.3	0.339 0.5	○ 0.290 -1.3						A
			0.307 -0.5	0.538 2.2	○ 1.102 2.4	1.111 1.0	1.078 0.3	0.528 0.1	0.311 0.6				B
		○ 0.433 -0.5	1.109 0.6	1.295 1.9	1.236 1.6	1.263 1.7	○ 1.225 1.0	○ 1.283 0.9	1.112 0.7	○ 0.440 1.1			C
	0.311 0.6	1.110 0.6	1.223 0.6	○ 1.323 1.8	1.354 1.6	○ 1.302 1.5	1.349 1.0	1.308 0.4	1.219 0.2	1.106 0.3	0.312 1.1		D
	○ 0.536 1.7	1.293 1.7	1.315 1.0	1.352 1.3	○ 1.251 1.2	1.251 0.9	1.257 0.3	1.328 -0.5	○ 1.291 -0.6	1.279 0.6	0.537 1.9		E
0.300 2.2	1.098 2.2	1.228 1.3	1.337 0.0	○ 1.258 0.3	1.215 0.6	1.192 0.3	○ 1.203 -0.4	1.230 -0.5	1.321 -0.9	1.214 -0.2	○ 1.088 1.1	0.301 2.5	F
0.343 1.8	○ 1.116 1.5	1.254 1.0	○ 1.284 0.1	1.238 -0.2	○ 1.186 -0.1	1.259 -0.7	1.181 -0.6	○ 1.225 -1.3	1.259 -1.8	○ 1.229 -1.1	1.111 1.0	○ 0.345 2.5	G
○ 0.299 1.8	1.092 1.4	○ 1.226 0.8	1.328 -0.4	1.226 -0.8	1.197 -0.9	1.179 -0.8	○ 1.198 -0.8	1.233 -1.6	○ 1.311 -1.9	1.184 -2.3	1.072 -0.2	0.303 3.0	H
	0.530 0.6	1.274 0.2	1.295 -0.4	○ 1.315 -1.5	1.239 -1.1	○ 1.217 -1.9	1.212 -1.9	1.298 -2.8	1.269 -2.6	○ 1.247 -1.9	0.521 -1.2		I
	0.308 -0.1	○ 1.105 0.2	1.212 -0.4	1.296 -0.5	1.322 -1.1	1.253 -2.3	○ 1.301 -2.4	1.249 -3.9	1.194 -1.9	1.090 -1.2	○ 0.305 -1.2		J
		0.435 0.0	○ 1.104 0.0	1.272 0.0	1.220 0.6	1.199 -3.5	1.202 -1.2	1.257 -1.1	1.119 1.5	0.432 -0.7			K
			○ 0.309 -0.1	0.527 0.0	1.095 1.9	1.122 2.0	1.095 1.7	○ 0.535 1.5	0.313 1.5				L
					0.299 1.9	○ 0.344 1.9	0.299 1.7						M

☐ Measured Power
Percent Difference (M-P)/P

○ Measured Location

FIGURE 4
INCORE Power Distribution - 99.6%
KEWAUNEE - CYCLE 29

1	2	3	4	5	6	7	8	9	10	11	12	13	
					0.316 0.3	0.359 -0.7	○ 0.310 -1.7						A
			0.320 -0.6	0.547 0.3	○ 1.097 0.5	1.118 -0.4	1.087 -0.1	0.544 -0.2	0.326 1.2				B
		○ 0.442 -0.6	1.089 0.3	1.257 0.7	1.221 0.1	1.291 -0.2	○ 1.216 0.0	○ 1.256 0.6	1.100 1.3	○ 0.451 1.4			C
	0.323 0.3	1.091 0.4	1.191 0.3	○ 1.286 1.0	1.325 0.3	○ 1.285 -0.1	1.323 0.0	1.278 0.1	1.195 0.5	1.090 0.4	0.326 1.4		D
	○ 0.552 1.2	1.264 1.3	1.281 0.4	1.316 0.6	○ 1.229 0.2	1.232 -0.1	1.235 -0.6	1.303 -0.4	○ 1.265 -0.7	1.256 0.6	0.557 2.1		E
0.318 1.0	1.102 1.2	1.221 0.4	1.316 -0.5	○ 1.239 -0.2	1.200 0.0	1.185 0.0	○ 1.193 -0.6	1.218 -0.7	1.309 -0.9	1.220 0.1	○ 1.104 1.1	0.322 2.1	F
0.361 -0.3	○ 1.124 0.1	1.296 0.2	○ 1.283 -0.3	1.226 -0.6	○ 1.179 -0.5	1.246 -0.6	1.174 -0.8	○ 1.216 -1.4	1.263 -1.8	○ 1.284 -0.8	1.134 1.0	○ 0.369 2.0	G
○ 0.314 -0.4	1.092 0.1	○ 1.222 0.2	1.315 -0.4	1.216 -0.8	1.188 -1.0	1.171 -1.1	○ 1.185 -1.2	1.219 -1.8	○ 1.305 -1.4	1.200 -1.4	1.094 0.5	0.321 2.0	H
	0.544 -0.3	1.252 0.3	1.272 -0.2	○ 1.296 -1.0	1.227 -1.2	○ 1.218 -1.2	1.212 -1.2	1.286 -1.8	1.257 -1.5	○ 1.242 -0.5	0.549 0.7		I
	0.322 0.1	○ 1.090 0.5	1.188 0.0	1.275 -0.1	1.308 -1.2	1.271 -1.2	○ 1.306 -1.2	1.261 -1.0	1.191 0.2	1.095 0.8	○ 0.325 0.7		J
		0.448 0.8	○ 1.096 0.9	1.263 1.2	1.226 0.8	1.281 -1.0	1.230 0.9	1.261 1.0	1.117 2.9	0.450 1.2			K
			○ 0.326 1.1	0.552 1.1	1.107 1.7	1.141 1.6	1.116 2.3	○ 0.561 2.8	0.331 2.8				L
					0.320 1.5	○ 0.367 1.5	0.322 2.2						M

☐ Measured Power
Percent Difference (M-P)/P

○ Measured Location

Serial No. 08-0380

ATTACHMENT 2

CYCLE 29 STARTUP REPORT

CYCLE 29 STARTUP REPORT
ROD DROP TIMES

KEWAUNEE POWER STATION
DOMINION ENERGY KEWAUNEE, INC.

Kewaunee Power Station
Cycle 29
Startup Report
Rod Drop Times

May 2008

RCCA Bank and Group	RCCA Core Location	Time from Start to Dash Pot (seconds)
Control Bank A1	F-2	1.271
	B-8	1.310
	H-12	1.286
	L-6	1.310
Control Bank A2	B-6	1.245
	F-12	1.272
	L-8	1.239
	H-2	1.278
Control Bank B1	F-6	1.305
	F-8	1.317
	H-8	1.297
	H-6	1.311
Control Bank D1	C-7	1.316
	G-11	1.235
	K-7	1.305
	G-3	1.256
Shutdown Bank A1	E-3	1.299
	I-11	1.312
Shutdown Bank A2	C-9	1.348
	K-5	1.348
Shutdown Bank B1	C-5	1.266
	E-11	1.272
	K-9	1.234
	I-3	1.307
Control Bank C1	D-10	1.281
	J-4	1.288
Control Bank C2	D-4	1.259
	G-7	1.359
	J-10	1.281

Note: All rods met rod drop time criterion of no greater than 1.8 seconds.